

Introduction to Graphic Literacy – Statistics, Graphs, and Charts



When you hear the word “math” or “charts and graphs”, what comes to mind? How about the word “statistics?” What do you think and how do you feel? How do you think your students think and feel?

Statistics does not need to be an intimidating word. Statistics are everywhere!

Most of us are using statistics in our everyday life either at home, in the community, and in the workplace. We use data to gather information and make important decisions. Data and Statistics are a part of our everyday life.

All math eventually leads to statistics. Visuals, charts, and graphs assist us in understanding them.

In addition to close reading, students need more specific math, graphic literacy, and visual literacy skills on the GED® Social Studies and Science Tests. For the Social Studies test, students will also need to know about Enduring Issues. For the Science Test, students will need to know about the Scientific Method.



The GEDTS® has identified the key focus for each test.

Social Studies



A focus on:

- Social Studies practices: skills of analysis, thinking, and reasoning
- Social Studies content: civics and government (50%), US history (20%), economics (15%), and geography and the world (15%)
- Items will test textual analysis and understanding, data representation and inference skills, as well as problem solving with social studies content, 50% in scenarios
- Each item aligned to both one Social Studies Practice and one Content Topic
- Both academic and workforce contexts

Science



A focus on:

- Science practices: skills of reasoning and thinking scientifically
- Science content: life science (40%), physical science (40%), and Earth and space science (20%)
- Items will test textual analysis and understanding, data representation and inference skills, as well as problem solving with science content, 50% in scenarios
- Each item aligned to both one Science Practice and one Content Topic
- Both academic and workforce contexts

The ability to interpret charts graphs and understand statistics is a key skill needed for the GED® Social Studies and Science Tests.

Where do we see statistics, graphs and charts on the GED® Test?

The **GEDTS® Performance Level Descriptors** define the skills needed for the test.

The GEDTS® has identified Performance Level Descriptors (PLDs) for each content area of the GED Test. The purpose of the PLDs is to identify the specific skills a test-taker will need to demonstrate in order to pass the GED® test. The levels are: Level 1 – Below Passing; Level 2 – Passing; Level 3- College Ready; and Level 4 – College Ready with Honors. When students take the GED® or GED® Ready test, the testing feedback will reference the PLDs that the test-taker did not fully demonstrate.

The following link provides the PLDs for each of the content areas with tips on how educators may use them in the classroom to improve student outcomes.

<https://gedtesting.com/educators/pldtips>

Many of the GED® Performance Level Indicators (PLDs) in Social Studies and Science require graphic literacy and math skills.

Students who score in the Green Zone on the GED® Ready practice test are likely to pass the GED® test. The skills listed below are the PLDs of those who are likely to pass the test.

Reasoning Quantitatively and Interpreting Data in Social Studies Contexts

- Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text at a satisfactory level

- Analyze information presented in a variety of maps, graphic organizers, tables, and charts; and in a variety of visual sources such as artifacts, photographs, political cartoons at a satisfactory level
- Translate quantitative information expressed in words in a text into visual form (e.g., table or chart); translate information expressed visually or mathematically into words at a satisfactory level
- Interpret, use, and create graphs including proper labeling at a satisfactory level. Predict trends within a reasonable limit, based on the data
- Represent data on two variables (dependent and independent) on a graph; analyze and communicate how the variables are related at a satisfactory level
- Distinguish between correlation and causation at a satisfactory level
- Calculate the mean, median, mode, and range of a data set at a satisfactory level

A student who scores in the Green Zone on the GED® Ready Test is likely to pass the GED® test and have demonstrated these skills:

Reasoning Quantitatively and Interpreting Data in Scientific Contexts

- Understand and explain non-textual scientific presentations at a satisfactory level
- Apply formulas from scientific theories at a satisfactory level
- Determine the probability of events at a satisfactory level
- Use counting and permutations to solve scientific problems at a satisfactory level

"In God, we trust. All others must bring data!" - W. Edwards Deming

Begin with the Basics

What is statistics and data anyway?

Do your students know a purpose for learning about statistics and data?

Helping your students to see the need for learning statistics beyond the GED® will assist them in understanding the content and learning quicker.

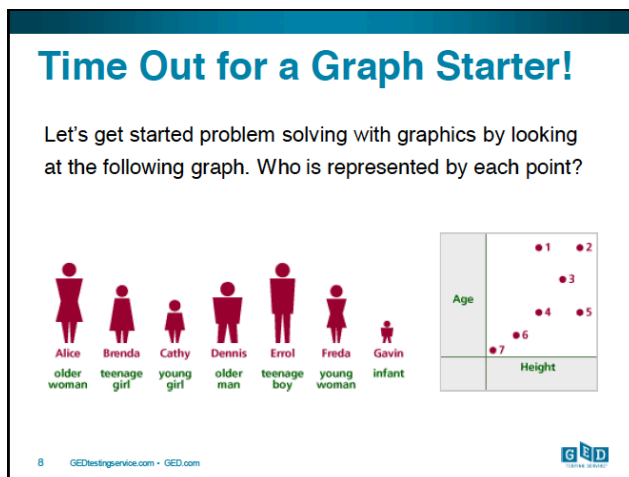
We may begin by showing them how they are already using math and statistics, without being aware, to make decisions in their everyday life. For example, they may decide to go to a movie because 7 of their 10 friends thought it was great. They may not have conducted a scientific experiment; but, chances are they have used data and statistics to make a decision.

Last week, we explored many different ways to engage students. When introducing your students to statistics and data, you may want to begin with a quote, such as the one above and ask them what they may infer from the quote.

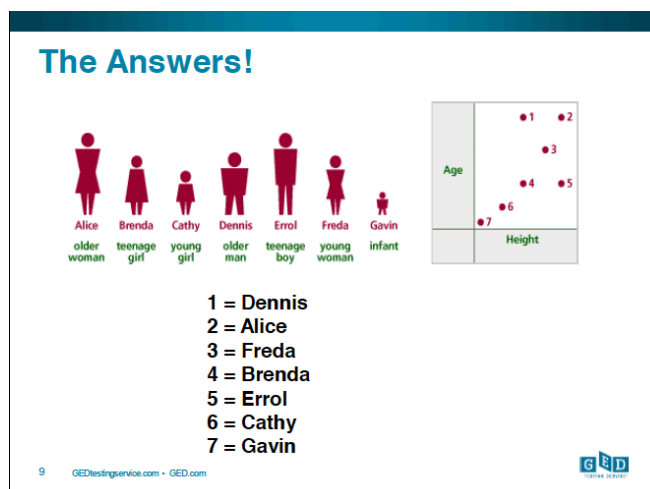
Do your students know how data is organized?

Start with a graph or chart and ask them what they think it means?

1. You may begin with a graphic similar to the one below. Ask students a text-based question to get them thinking about the graph. If they struggle, you may want to model a few questions that you would use to interpret the graph and think aloud your thinking when you read the graph.



After they answer the question, ask students critical thinking questions to discover how they came up with the answers. The purpose is to get them to use the higher order, critical thinking skills that they will need to interpret charts and graphs. After you provide them with the answers, you may want to model questioning that you would use to interpret the graph.



2. Another way, or a second step, to introduce them to the concept, is to show them text and ask them how to display the information. If they struggle, you may ask them text-based questions that guide them through the process. With struggling students, you can model it for them first.

Organizing Data

During the 2005-2006 academic year, a survey of the holdings of university research libraries and rank was done in the United States and Canada. It was found that Syracuse University, in New York, had 2,392,147 holdings, and was figured to rank eighty-first. Harvard University ranked first with 13,369,855 holdings. The University of Connecticut was ranked fiftieth place, and reported 2,626,066 holdings. The Massachusetts Institute of Technology reported 2,448,647 holdings, and was ranked in seventy-third place.

(Source: Association of Research Libraries)

Tables present data in rows and columns that

- can be compared and contrasted
- can be transferred easily to another graph
- may help determine type of graph to use

Institution	Rank	Holdings
Harvard University	1	13,369,855
U. of Connecticut	50	2,626,066
Mass. Institute Tech.	73	2,448,647
Syracuse University	81	2,392,147

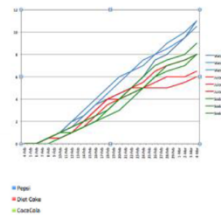
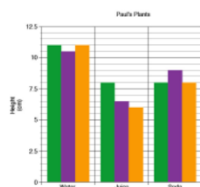
3. Next, you may begin to explain the different ways that information is represented and that some ways are better suited for data than others

At this point you may want to define statistics and data more specifically. You may even use a vocabulary word chart. Frayer Model <https://www.worksheetworks.com/miscellanea/graphic-organizers/frayer.html>

There are three main types of graphs, line graphs, bar graphs, and circle graphs.

Circles, Lines, and Bars – Oh My!

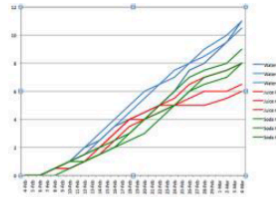
Know which type of graph is best suited for the data



Do your students know...

Line graphs

- Are most popular type of graph
- Are easy to create and understand
- Organize and present data clearly and show relationships
- Can forecast results not yet gathered
- Show changes in direction – trends
- Compare two variables
- x-axis usually represents time
- y-axis represents percentage or measures of quantity



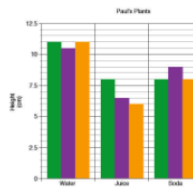
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Do your students know...

Bar graphs

- Are used to present and compare data
 - Consist of regular bars based on value or frequency
 - Include scales on the axes
 - Present a numerical or categorical variable for each bar
 - Can include single, double, or multiple bars
- Vertical bar graphs work well for comparing
- Time series
 - Frequency distribution



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Do your students know...

Circle graphs (pie charts)

- Are easy to make and read
- Represent categorical data or values of variables
- Are divided into segments which reflect proportion of variable to the whole
- Work best if segments are ordered clockwise from largest to smallest (easier to read)
- Can be messy and hard to understand if too many segments are included
- Can be difficult to interpret if segments are too close in size



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Bonus Optional Resource

<https://nces.ed.gov/nceskids/createagraph/>

If your students can overlook the “kids” theme, this is a great tool for adult students to practice creating charts and graphs.

Activity for Students

Allowing your students take a look at data and represent it in multiple ways using graphs and charts is one of the most effective means of assisting your students in learning about statistics.

Have students read and interpret the graphs and charts in the following website document “The Rising Cost of Not Going to College.” <http://www.pewsocialtrends.org/2014/02/11/the-rising-cost-of-not-going-to-college/>

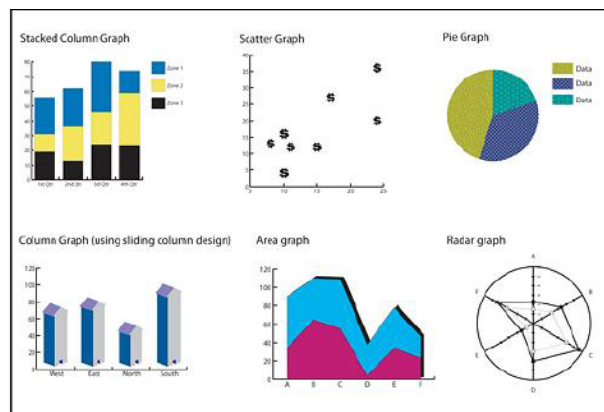
Higher Level students: Hide the graph and ask them to create one.

Middle Level students: Ask them to represent the data in another format than the one shown.

Lower Level students: Ask them to compare and contrast the graphs and charts.

Multiple Ways to Display Data

It is important to teach your students that the same data may be displayed multiple ways.



Below is an example that you may show students. It is the same data shown multiple ways.

Representing Data in Different Formats

Think of the simplest way you can organize the data below, showing the length of nails found in a packet of assorted nails.

Length of Nails (mm)																
11	22	29	15	17	27	21	23	27	26	19	16	11	10	16	15	21
21	17	15	23	20	16	17	25	16	21							

One way is to arrange it in increasing order.

Nails arranged in order of increasing length (mm)																
10	11	11	15	15	15	16	16	16	16	17	17	17	19	20	21	21
21	21	22	23	23	25	26	27	27	29							

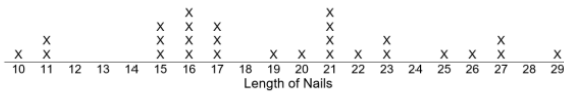
Use a Tally Table

Nails arranged in order of increasing length (mm)																
10	11	11	15	15	15	16	16	16	16	17	17	17	19	20	21	21
21	21	22	23	23	25	26	27	27	29							

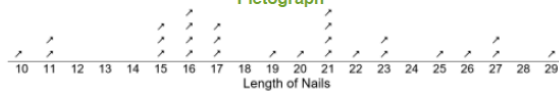
Length	Tally	Length	Tally
10	I	20	I
11	II	21	III
12		22	I
13		23	II
14		24	
15	III	25	I
16	III	26	I
17	III	27	II
18		28	
19	I	29	I

Line Plot or Pictographs

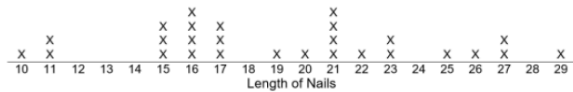
Line Plot



Pictograph



Frequency Table



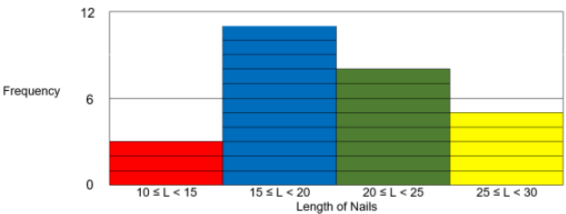
Frequency Table

Length of Nails	
Length	Frequency
$10 \leq L < 15$	3
$15 \leq L < 20$	11
$20 \leq L < 25$	8
$25 \leq L < 30$	5

Length of Nails				
Frequency	3	11	8	5
Length	$10 \leq L < 15$	$15 \leq L < 20$	$20 \leq L < 25$	$25 \leq L < 30$



Histogram



Length of Nails				
Frequency	3	11	8	5
Length	$10 \leq L < 15$	$15 \leq L < 20$	$20 \leq L < 25$	$25 \leq L < 30$

